

**VIRGINIA DEPARTMENT OF MINES, MINERALS & ENERGY**

**DIVISION OF MINES**



**SURFACE FACILITIES FOREMAN**

**CERTIFICATE STUDY GUIDE**

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Commonwealth of Virginia  
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**DEPARTMENT OF MINES MINERALS AND ENERGY  
DIVISION OF MINES  
DISCLAIMER**

Article 3 of the **Coal Mine Safety Laws of Virginia** establishes requirements for certification of coal mine workers. The certification requirements are included in §45.1-161.24 through §45.1-161.41 in which the Board of Coal Mining Examiners is established for the purpose of administering the certification program. The Board has promulgated certification regulations 4 VAC 25-20, which set the minimum standards and procedures required for Virginia coal miner examinations and certifications.

The Virginia Department of Mines Minerals and Energy, Division of Mines developed this study guide to better train coal miners throughout the mining industry. The study guide material should be used to assist with the knowledge necessary for coal mining certifications. The material is not all-inclusive and should be used only as an aide in obtaining knowledge of the mining practices, conditions, laws and regulations. This material is based upon the Coal Mining Safety Laws of Virginia, Safety and Health Regulations for Coal Mines in Virginia, Title 30 Code of Federal Regulations (30 CFR), State and Federal Program Policy Manuals and other available publications. Nothing herein should be construed as recommending any manufacturer's products.

**The study guide and materials are available at the Department of Mines, Minerals and Energy. Any questions concerning the study guide should be addressed to the Regulatory Boards Administrator at the Big Stone Gap Office.**

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## INTRODUCTION

Article 3 of the Coal Mine Safety Laws of Virginia establishes requirements for certification of coal mine workers. The certification requirements are included in section 45.1-161.24 through 45.1-161.41 in which the Board of Coal Mining Examiners is established for the purpose of administering the certification program. The Board has promulgated certification regulations 4 VAC 25-20, which set the minimum standards and procedures required for Virginia coal miner examination and certifications.

Each applicant for a surface facilities foreman certificate shall demonstrate to the Board of Coal Mining Examiners by written oral examination that he has thorough knowledge of shops, labs or warehouses and has appropriately related work experience approved by the Division of Mines. In addition, each applicant shall pass the examinations in first aid\* and gas detection. The holder of a surface facilities foreman certificate issued by the Board shall be authorized to act as surface facilities foreman. This certification shall **not** be used in lieu of the Surface Foreman, Prep Plant Foreman or Dock Foreman certifications.

\*First Aid for Miners Study Guide will be used for this section requirement of the certification exam.

## **PURPOSED AND SCOPE**

### **Purpose**

The purpose of the Surface Facilities Foreman Certification Study Guide is to assist a qualified applicant in obtaining the Surface Facilities Foreman certification. The Board of Coal Mining Examiners (BCME) may require certification of persons who work in shops, labs and/or warehouses and persons whose duties and responsibilities in relation these areas require competency, skill or knowledge in order to perform consistently with the health and safety of persons and property.

### **Scope**

The applicant for Surface Facilities Foreman must possess at least one year of practical mining experience and 30 days surface facilities experience under the direction of a certified surface facilities foreman or appropriately related work experience approved by the Chief of the Division of Mines. The applicant for surface facilities foreman certification must also hold a General Miner Certification and have received current first aid training (MSHA first aid 5000-23 acceptable).

The surface facilities foreman certification authorizes the holder to perform foreman and/or examiner duties at shops, labs and warehouses required by State and Federal laws and regulations.

## **SECTION 1**

## **COAL MINE SAFETY LAWS OF VIRGINIA**

### **45.1-161.11. Persons not permitted to work in mines.**

- A. No person under eighteen years of age shall be permitted to work in or around any mine, and in cases of doubt, the operator, agent or mine foreman shall obtain a birth certificate or other documentary evidence, from the Registrar of Vital Statistics, or other authentic sources as to the age of such person.
- B. No operator, agent or mine foreman shall make a false statement as to the age of any person under eighteen years of age applying for work in or around any mine.

### **45.1-161.28. Certification of certain persons employed in coal mines; powers of Board of Coal Mining Examiners.**

- A. The Board of Coal Mining Examiners may require certification of persons who work in coal mines and persons whose duties and responsibilities in relation to coal mining require competency, skill or knowledge in order to perform consistently with the health and safety of persons and property. The following certifications shall be issued by the Board, and a person holding such certification shall be authorized to perform the tasks which this Act or any regulation promulgated by the Board or by the Department requires to be performed by such a certified person:

### **45.1-161.78. Operator's reports of accidents; investigations; reports by Department.**

- A. Each operator will report promptly to the Department the occurrence at any mine of any accident. The scene of the accident shall not be disturbed pending an investigation, except to the extent necessary to rescue or recover a person, prevent or eliminate an imminent danger, prevent destruction of mining equipment, or prevent suspension of use of a slope, entry or facility vital to the operation of a section or a mine. In cases where reasonable doubt exists as to whether to leave the scene unchanged, the operator will secure prior approval from the Department before any changes are made.
- B. The Chief will go personally or dispatch one or more mine inspectors to the scene of such a coal mine accident, investigate causes, and issue such orders as may be needed to ensure safety of other persons.
- C. Representatives of the operator will render such assistance as may be needed and act in a consulting capacity in the investigation. An employee if so designated by the employees of the mine will be notified, and as many as three employees if so designated as representatives of the employees may be present at the investigation in a consulting capacity.
- D. The Department will render a complete report of circumstances and causes of each accident investigated, and make recommendations for the prevention of similar accidents. The Department will furnish one copy of the report to the operator, and one copy to the employee representative when he has been present at the investigation. The Chief shall maintain a complete file of all accident reports for coal mines, and shall give such further publicity as may be ordered by the Director in an effort to prevent mine accidents.

### **45.1-161.79. Reports of other accidents and injuries.**

- A. Each miner employed at a mine shall promptly notify his supervisor of any injury

- received during the course of his employment.
- B. Each operator shall keep on file a report of each accident including any accident which does not result in a lost-time injury. Copies of such report shall be given to the person injured or to his designated representative to review the accident report and verify its accuracy prior to filing such report for the review of state or federal mine inspectors.

**45.1-161.86. Denial of entry.**

No person shall deny the Chief or the Director, as applicable, or any mine inspector entry upon or through a mine for the purpose of conducting an inspection or any office at the site where maps or records relating to the mine are located, pursuant to this Act.

**45.1-161.236. Housekeeping; noxious fumes.**

- A. Good housekeeping shall be practiced in and around buildings, shafts, slopes, yards and other areas of mine. Such practices include cleanliness, orderly storage of materials, and the removal of possible sources of injury, such as stumbling hazards, protruding nails, broken glass and possible falling and rolling materials.
- B. Painting or operations creating noxious fumes shall be performed only in a well-ventilated atmosphere.
- C. All surface mine structures, enclosures, and other facilities shall be maintained in good repair.

**45.1-161.237. Lighting.**

- A. Lights shall be provided as needed in or on surface structures.
- B. Roads, paths and walks outside of structures shall be kept free from obstructions and shall be well illuminated, if used at night.

**45.1-161.238. Flammable or combustible material.**

- A. Oil, grease, and similar flammable materials shall be kept in closed containers, separate from other materials so as not to create a fire hazard to nearby buildings or mines. If oil or grease is stored in a building, the building or room in which it is stored shall be of fireproof construction and well ventilated.
- B. Oily rags, oily waste and wastepaper shall be kept in closed metal containers until removed for disposal.
- C. The area within 100 feet of all mine openings shall be kept free of combustible material; however, this shall not apply to the temporary storage of not more than a one day's supply of such materials.
- D. All oxygen and acetylene bottles shall be stored in racks designated and constructed for the storage of such bottles with caps in place and secured when not in use. Any storage place for such materials shall be posted to prohibit smoking.

**45.1-161.239. Crane operation.**

A crane operator shall at all times during any hazardous crane operation maintain visual or auditory communication with all persons involved in the crane operation.

**45.1-161.240. Controlling dust at surface.**

- A. In surface structures at excessively dusty mines, electric motors, switches, lighting fixtures, and controls shall be protected by dust-tight construction.
- B. Surface structures and equipment shall be kept free of coal dust accumulations.
- C. Where mining operations raise an excessive amount of dust into the air, water or water with wetting agent added to it or other effective methods shall be used to allay such dust at its sources.

**45.1-161.241. Scaffolding and overhead protection.**

Where repairs are being made to the plant, or where equipment or material is being used or transported overhead, proper scaffolding or proper overhead protection shall be provided.

**45.1-161. 242. Welding and cutting.**

Welding or cutting with arc or flame shall not be done in excessively dusty atmospheres or dusty locations. Fire-fighting apparatus shall be readily available when welding or cutting is performed.

**45.1-161.256. Safety examinations.**

- A. On-shift examinations of the work area including pit, auger, thin seam and highwall operations, shall be conducted by certified persons once every production shift and at such other times or frequency as the Chief designates necessary for dangerous conditions.
- B. Pre-operational examinations of all mobile equipment shall be conducted by an authorized person.
- C. Pre-shift examinations shall be conducted by a certified person for certain hazardous conditions designated by the Chief.
- E. The location of all natural gas pipelines on permitted surface mine areas shall be identified and conspicuously marked so that equipment operators can readily see such lines. Pre-shift examinations shall be conducted of the location of pipelines whenever the work area approaches within 500 feet unless otherwise approved by the Chief.
- G. Examinations for methane shall be conducted in surface installations, enclosures or other facilities in which coal is handled or stored once each production shift. Such areas shall also be tested for methane before any activity involving welding, cutting or an open flame. Examinations pursuant to this subsection shall be made by an authorized person certified to make gas tests.
- H. Electrical equipment and wiring shall be inspected as often as necessary but at least once a month.
- I. Fire extinguishers shall be examined at least once every six months.

**45.1-161.257. Records of examinations.**

- A. Documentation of examinations and testing conducted pursuant to § 45.1-161.256 shall be recorded in a mine record book provided for that purpose. Documentation shall include hazardous conditions found in the work area. However, examinations of fire extinguishers shall be conducted by an authorized person and documentation shall be accomplished by recording the date of the examination on a permanent tag attached to the extinguisher.
- B. The actual methane readings taken during examinations required under this Act



shall be recorded in the mine record book.

- C. The surface foreman shall maintain and sign a daily record book. Where such reports disclose hazardous conditions, the surface foreman shall take prompt action to have such conditions corrected, barricaded or posted with warning signs.
- D. Records shall be countersigned by the supervisor of the examiner creating the records. Where such records disclose hazardous conditions, the countersigning of the records shall be performed no later than the end of the next regularly scheduled working shift following the shift for which the examination records were completed, and the person countersigning shall ensure that actions to eliminate or control the hazardous conditions have been taken. Where such records do not disclose hazardous conditions, the countersigning may be completed within 24 hours following the end of the shift for which the examination records were completed. The operator may authorize another person with equivalent authority of the supervisor to act in the supervisor's temporary absence to read and countersign the records and ensure that action is taken to eliminate the hazardous conditions disclosed in the records.
- E. When one individual serves in more than one position that is required to countersign such reports, he shall only be required to sign each report once.
- F. All records of inspections shall be open for inspection by interested persons and maintained at the mine site for a minimum of one year.

**45.1-161.258. Areas with safety or health hazards.**

Any hazardous condition shall be corrected promptly or the affected area shall be barricaded or posted with warning signs specifying the hazard and proper safety procedures. Any imminent danger that cannot be removed within a reasonable time shall be reported to the Chief by the quickest available means.

**45.1-161.259. Personal protection devices and practices.**

- A. All persons at a surface coal mine shall wear the following protection in the specified conditions:
  - 1. Hard hats in and around mines where falling objects may cause injury.
  - 2. Hard-toed footwear in and around mines.
  - 3. Safety goggles or shields where there is a hazard of flying material.
  - 4. Protective shield or goggles when welding.
  - 5. Snug-fitting clothes when working around moving parts or machinery.
  - 6. Gloves where hands could be injured. Gauntlet cuffed gloves are prohibited around moving machinery.
- B. Ear protection shall be supplied by the operator to all miners upon request

**45.1-161.260. Housekeeping.**

- A. Good housekeeping shall be practiced in and around buildings, shafts, slopes, yards and other areas of the mine. Such practices include cleanliness, orderly storage of materials, and the removal of possible sources of injury, such as stumbling hazards, protruding nails, broken glass and material that may potentially fall or roll.
- B. All surface mine structures, enclosures, and other facilities shall be maintained in a safe condition.

**45.1-161.261. Noxious fumes.**

Painting or operations creating noxious fumes shall be performed only in a well-ventilated atmosphere.

**45.1-161.262. First aid equipment.**

Each surface coal mine shall have an adequate supply of first aid equipment as determined by the Chief. Such supplies shall be located at strategic locations at the mine site so as to be available in a reasonable response time. The first aid supplies shall be encased in suitable sanitary receptacles designed to be reasonably dust-tight and moisture proof. In addition to the supplies in the cases, blankets, splints and properly constructed stretchers in good conditions shall be provided. The supplies shall be available for use of all persons employed at the mine. No first aid supplies shall be removed or diverted without authorization except in case of injury at the mine.

**45.1-161.263. First-aid training.**

- A. Surface foremen shall have completed and passed a first aid course of study as prescribed by the Chief. The Chief is authorized to utilize the Department's educational and training facilities in the conduct of such training programs and may require the cooperation of mine operators in making such programs available to their employees.
- B. Each operator of a surface coal mine, upon request, shall make available to every miner employed in such mine first aid training, including refresher training.

**45.1-161.264. Attention to injured persons.**

- A. Prompt medical attention shall be provided in the event of an injury, and adequate facilities shall be made available for transporting injured persons to a hospital where necessary.
- B. Safe transportation shall be provided to move injured persons from the site where the injury occurred to areas accessible to emergency transportation.
- C. The operator of each mine shall post directional signs that are conspicuously located to identify the routes of ingress to and egress from any mine located off a public road.

**45.1-161.265. Fire-fighting equipment; duties in case of fire; fire precaution in transportation of mining equipment; fire prevention generally.**

- A. Each mine shall be provided with suitable fire-fighting equipment, adequate for the size of the mine and shall include at least three twenty-pound dry chemical fire extinguishers. Equipment and devices used for the detection, warning and extinguishing of fires shall be suitable in type, size and quantity for the type of fire hazard that may be encountered. Such equipment and devices shall be strategically located and plainly identified.
- B. Fire extinguishers, suitable from a toxic and shock standpoint, shall be provided and placed at or on all (i) electrical stations, such as substations, transformer stations and permanent pump stations, (ii) self-propelled mobile equipment, (iii) belt heads, (iv) areas used for the storage of flammable materials, (v) fueling stations, and (vi) other areas that may constitute a fire hazard, so as to be out of the smoke in case of a fire.

**45.1-161.266. Duties in case of fire.**

- A. Should a fire occur, the person discovering it and any person in the vicinity of the fire shall make a prompt effort to extinguish it. When a fire that may endanger persons at the mine cannot be extinguished immediately, all person shall be withdrawn promptly from the area of the fire.
- B. In case of any unplanned fire at or about a mine not extinguished within thirty minutes of discovery, the operator or agent shall report by the quickest available means to the Chief, giving all information known to him regarding the fire. The Chief shall take prompt action, based on the information, to go in person or dispatch qualified subordinates to the scene of the fire for consultation, and assist in the extinguishing of the fire and the protection of exposed persons. In the event of a difference of opinion as to measures required, the decision of the Chief or his designated subordinate shall be final, but must be given to the operator in writing to have the force of an order.

**45.1-161.267. Fire precautions.**

- A. No person shall smoke or use an open flame within twenty-five feet of locations used to handle or store flammable or combustible liquids or where an arc or flame may cause a fire or explosion.
- B. Areas surrounding flammable liquid storage tanks, electrical substations and transformers shall be kept free of combustible material for at least twenty-five feet in all directions. Such storage tanks, substations and transformers shall be posted with readily visible fire hazard warning signs.
- C. Structures or areas used for storage of flammable materials shall be constructed of fire resistant material, well ventilated, kept clean and orderly and posted with readily visible fire hazard warning signs.
- D. Fuel lines shall be equipped with shut-off valves at the sources. Such valves shall be readily accessible and maintained in good operating condition.
- E. Battery charging areas shall be well ventilated and posted with warning signs prohibiting smoking or open flames within twenty-five feet.
- F. Oil, grease, other flammable hydraulic fluid, and other flammable materials shall be kept in closed metal containers and separated from other materials so as to not create a fire hazard.
- G. Combustible materials, grease, lubricants, paints and other flammable materials and liquids shall not be allowed to accumulate where they could create a fire hazard. Provision shall be made to prevent the accumulation of such material on any equipment, at storage areas and any location where the material is used.
- H. Electric motors, switches, lighting fixtures, and controls shall be protected by dust-tight construction.
- I. Precautions shall be taken to ensure that sparks or other hot materials do not result in a fire when welding or cutting. Welding or cutting with arc or flame shall not be done in excessively dusty atmospheres or locations. Fire-fighting apparatus shall be readily available when welding or cutting is performed.
- J. Precautions shall be taken before applying heat, cutting or welding on any pipe or container that has contained a flammable or combustible material.
- K. Oxygen and acetylene bottles shall be stored in racks designated and constructed for the storage of such bottles with caps in place and secured when not in use.

- Such bottles shall not be stored near oil, grease, and other flammable material.
- L. Oxygen and acetylene gauges and regulators shall be kept clean and free of oil, grease, and other combustible materials.
  - P. Internal combustion engines, except diesel engines, shall be shut off prior to fueling.

**45.1-161.268. Haulage and mobile equipment; operating condition.**

- A. All mobile equipment shall be maintained in a safe operating condition.
- B. Positive-acting stopblocks shall be used where necessary to protect persons from danger of moving or runaway haulage equipment.
- C. Where it is necessary for men to cross conveyors regularly, suitable crossing facilities shall be provided.
- D. Persons shall not get on or off moving equipment.
- E. When the equipment operator is present, persons shall notify him before getting on or off mobile equipment.
- F. Mobile equipment shall not be left unattended unless brakes are set. Mobile equipment with wheels or tracks, when parked on a grade, shall either be blocked or turned into a bank unless the lowering of the bucket or blade to the ground will prevent movement.
- G. Persons shall not work on or from a piece of mobile equipment in a raised position unless the equipment is specifically designed to lift persons.
- H. Water, debris or spilled materials which may create hazards to moving equipment shall be removed.
- I. Where seating facilities are provided on self-propelled mobile equipment, the operator shall be seated before such equipment is moved. No person shall be allowed to ride on top of self-propelled mobile equipment.
- J. Operators of self-propelled haulage equipment shall sound a warning before starting such equipment and as approaching any place where persons are or are likely to be.

**45.1-161.269. Equipment operation.**

- D. Before starting or moving equipment, an equipment operator must be certain by signal or other means that all person are clear.

**45.1-161.270. Safety measures on equipment.**

- A. Seat belts provided in mobile equipment shall be maintained in safe working condition. Operators of such equipment shall wear seat belts when the equipment is in motion.
- B. Mobile equipment shall be equipped with adequate brakes and parking brakes.
- C. Cab windows shall be of safety design, kept in good condition and clean for adequate visibility.
- D. Tires shall be deflated before repairs on them are started and adequate means shall be provided to prevent wheel locking rims from creating a hazard during tire inflation.
- E. An audible warning device and headlights shall be provided on all self-propelled mobile equipment.
- F. An automatic backup alarm, that is audible above surrounding noise levels shall be provided on all mobile equipment. An automatic, reverse activated strobe light

may be substituted for an audible alarm when mobile equipment is operated at night.

- G. All equipment raised for repairs or other work shall be securely blocked prior to persons positioning themselves where the falling of such equipment could create a hazardous condition.

**45.1-161.271. Transportation of personnel.**

No person shall be permitted to ride or be otherwise transported on or in: (i) dippers, shovels, buckets, forks and clamshells, (ii) the cargo space of dump trucks, (iii) outside cabs or beds of heavy equipment, or (iv) chain, belt or bucket conveyors unless specifically designed to transport persons.

**45.1-161.272. Lighting.**

- A. Lights shall be provided as needed, in or on surface structures.
- B. Roads, paths and walks outside of surface structures shall be kept free from obstructions and shall be well illuminated if used at night.

**45.1-161.273. Shop and other equipment.**

- A. The following shall be guarded and maintained adequately:
  - 1. Gears, sprockets, pulleys, fan blades or propellers, friction devices and couplings with protruding bolts or nuts.
  - 2. Shafting and projecting shaft ends that are within seven feet of floor or platform.
  - 3. Belt, chain or rope drives that are within seven feet of floor or platform.
  - 4. Fly wheels. Where fly wheels extend more than seven feet above the floor, they shall be guarded to a height of at least seven feet.
  - 5. Circular and band saws and planers.
  - 6. Repair pits. Guards shall be kept in place when the pits are not in use.
  - 7. Counterweights.
  - 8. Mine fans. The approach shall be guarded.
  - 9. Lighting and other electrical equipment that may cause shock hazards or personal injury.
- B. Machinery shall not be repaired or oiled while in motion; provided, however, that this shall not apply where safe remote oiling devices are used.
- C. A guard or safety device removed from any machine shall be replaced before the machine is put in operation.
- D. Mechanically operated grinding wheels shall be equipped with:
  - 1. Safety washers and tool rests.
  - 2. Substantial retaining hoods, the hood opening of which shall not expose more than a ninety-degree sector of the wheel. Such hoods shall include a device to control and collect excess rock, metal or dust particles, or equivalent protection shall be provided to the employees operating such machinery.
  - 3. Eye shields, unless goggles are worn by the operators.
- E. The operator or his agent shall develop procedures for examining for potential hazards, completing proper maintenance, and properly operating each type of centrifugal pump. The procedures shall, at a minimum, address the manufacturers' recommendations for start-up and shutdown of the pumps, proper

actions to be taken when a pump is suspected of overheating, safe location of start and stop switches, and actions to be taken when signs of structural metal fatigue such as cracks in the frame, damaged cover mounting brackets, or missing bolts or other components are detected. All miners who repair, maintain, or operate such pumps shall be trained in these procedures.

**45.1-161.274. Hydraulic hoses.**

All hydraulic hoses used on equipment purchased after January 1, 1986, shall be clearly stamped or labeled by the hydraulic hose manufacturer to indicate the manufacturer's rated pressure in pounds per square inch (psi). For hoses purchased after January 1, 1989, the rated pressure shall be permanently affixed on the outer surface of the hose and repeated at least every two feet. Hoses purchased and installed on automatic displacement hydraulic systems shall have a four-to-one safety factor based on the ratio between minimum burst pressure and the setting of the hydraulic unloading system (such as a relief valve) or shall meet the minimum hose pressure requirements set by the hydraulic equipment manufacturer per the applicable hose standards for each type of equipment. No hydraulic hose shall be used in an application where the hydraulic unloading system is set higher than the hose's rated pressure.

**45.1-161.275. Stairways, platforms, runways and floor opening.**

- A. Stairways, platforms, and runways shall be provided where men work or travel.
- B. Stairways, elevated platforms, floor openings and elevated runways shall be equipped with suitable handrails or guardrails.
- C. Elevated platforms, floor openings, stairways and runways shall be provided with toe boards. Platforms, stairways and runways shall be kept clear of stumbling and slipping hazards and maintained in good repair.

**45.1-161.277. Equipment operation.**

- B. Dippers, buckets, scraper blades and similar movable parts shall be secured or lowered to the ground when not in use.
- C. Equipment which is to be hauled shall be loaded and protected so as to prevent sliding or spillage. When moving between work areas the equipment shall be secured in the travel position.
- D. Tow bars shall be used to tow heavy equipment and a safety chain shall be used in conjunction with each tow bar.
- E. Dust control measures shall be taken so as to not obstruct visibility of equipment operators.
- F. Dippers, buckets, loading booms or other heavy loads shall not be swung over cabs of haulage equipment until the driver is out of the cab and is in a safe location unless the equipment is designed specifically to protect drivers from falling material.
- G. Lights, flares or other warning devices shall be posted when parked equipment creates a hazard for other vehicles.

**45.1-161.278. Control of dust and combustible material.**

- C. Loose coal, coal dust, oil, grease, and other combustible materials shall not be permitted to accumulate excessively on equipment or surface structures.

**45.1-161.279. Overhead high-potential power lines; surface transmission lines; electric wiring in surface buildings.**

- A. Overhead high-potential power lines shall be placed at least fifteen feet above the

- ground and twenty feet above driveways and haulage-ways, shall be installed on insulators, and shall be supported and guarded to prevent contact with other circuits.
- B. Surface transmission lines shall be protected against short circuits and lightning.
  - C. Electric wiring in surface buildings shall be installed so as to prevent fire and contact hazards.

**45.1-161.280. Transformers**

- A. Unless surface transformers are isolated by elevation (eight feet or more above the ground), they shall be enclosed in a transformer house or surrounded by a suitable fence at least six feet high. If the enclosure or fence is of metal, it shall be grounded effectively. The gate or door to the enclosure shall be kept locked at all times, unless authorized by persons are present.
- B. Surface transformers containing flammable oil and installed where they present a fire hazard shall be provided with means to drain or to confine the oil in the event of rupture of the transformer casing.
- C. Suitable danger signs shall be posted conspicuously at all transformer stations on the surface.
- D. All transformer stations on the surface shall be kept free of nonessential combustible materials and refuse.
- E. No electrical work shall be performed on low-voltage, medium-voltage, or high-voltage distribution circuits or equipment, except by a certified person or by a person trained to perform electrical work and to maintain electrical equipment under the direct supervision of a certified person. All high-voltage circuits shall be grounded before repair work is performed. Disconnecting devices shall be locked out and suitably tagged by the persons who perform electrical or mechanical work on such circuits or equipment connected to the circuits, except that in cases where locking out is not possible, such devices shall be opened and suitably tagged by such persons. Locks and tags shall be removed only by the persons who installed them or, if such persons are unavailable, by certified persons authorized by the operator or his agent. However, employees may, where necessary, repair energized trolley wires if they wear insulated shoes and lineman's gloves. This section does not prohibit certified electrical repairmen from making checks on or troubleshooting energized circuits or the performance of repairs or maintenance on equipment by authorized persons once the power is off and the equipment is blocked against motion, except where motion is necessary to make adjustments.

**45.1-161.281. Grounding.**

- A. All metallic sheaths, armors, and conduits enclosing power conductors shall be electrically continuous throughout and shall be grounded effectively.
- B. Metallic frames, casing, and other enclosures of stationary electric equipment that can become "alive" through failure of insulation or by contact with energized parts shall be grounded effectively or equivalent protection shall be provided.
- C. When electric equipment is operated from three-phase alternating current circuits originating in transformers connected to provide a neutral point, a continuous grounding conductor of adequate size shall be installed and connect to the neutral point and to the frames of the power-utilizing equipment. Such grounding

conductors shall be grounded at the neutral point and at intervals along the conductor if feasible. A suitable circuit breaker or switching device shall be provided having a ground-trip coil connected series with the grounding conductor to provide effective ground-fault tripping.

**45.1-161.282. Circuit breakers and switches.**

- A. Automatic circuit breaking devices or fuses of the correct type and capacity shall be installed so as to protect all electric equipment and power circuits against excessive overload. Wires or other conducting materials shall not be used as a substitute for properly designed fuses, and circuit-breaking devices shall be maintained in good operating condition.
- B. Operating controls, such as switches, starters and switch buttons, shall be so installed that they are readily accessible and can be operated without danger of contact with moving or live parts.
- C. Electric equipment and circuits shall be provided with switches or other controls of safe design, construction and installation.
- D. Insulating mats, or other electrically nonconductive materials shall be kept in place at each switchboard, power-control switch, and at stationary machinery where shock hazards exist.
- E. Suitable danger signs shall be posted conspicuously at all high-voltage installations.
- F. All power wires and cables shall have adequate current-carrying capacity, shall be guarded from mechanical injury and installed in a permanent manner.
- G. Power circuits shall be labeled to indicate the unit or circuit they control.
- H. Persons shall stay clear of an electrically powered shovel or other similar heavy equipment during an electrical storm.
- I. All devices installed on or after July 1, 2005, which provide either short circuit protection or protection against overload, shall conform to the minimum requirements for protection of electric circuits and equipment of the National Electric Code in effect at the time of their installation.
- J. All electric conductors installed on or after July 1, 2005, shall be sufficient in size to meet the minimum current-carrying capacity provided for in the National Electric Code in effect at the time of their installation.
- K. All trailing cables purchased on or after July 1, 2005, shall meet the minimum requirements for ampacity provided in the standards of the Insulated Power Cable Engineers Association - National Electric Manufacturers Association in effect at the time such cables are purchased.

**45.1-161.283. Electrical trailing cables.**

- A. Trailing cables shall be provided with suitable short-circuit protection and means of disconnecting power from the cable.
- B. Temporary splices in trailing cables shall be made in a workmanlike manner, mechanically strong, and well insulated.
- C. The number of temporary, unvulcanized splices in a trailing cable shall be limited to one.
- D. Permanent splices in trailing cables shall be made as follows:
  - 1. Mechanically strong with adequate electrical conductivity and flexibility.
  - 2. Effectively insulated and sealed so as to exclude moisture.



3. The finished splice shall be vulcanized or otherwise treated with suitable materials to provide flame-resistant properties and good bonding to the outer jacket.
- E. Trailing cables shall be protected against mechanical injury.

## **SECTION 2      CODE OF FEDERAL REGULATIONS, TITLE 30, PART 77**

### **Subpart B--Qualified and Certified Person**

#### **77.100 Certified persons.**

(a)(1) The provisions of this Part 77 require that certain examinations and tests be made by a certified person. A certified person within the meaning of these provisions is a person who has been certified in accordance with the provisions of paragraph (b) of this §77.100 to perform the duties, and make the examinations and tests which are required by this Part 77 to be performed by a certified person.

(2) A person who has been so certified shall also be considered to be a qualified person within the meaning of those provisions of this Part 77 which require that certain examinations, tests and duties be performed by a qualified person, except those provisions in Subparts F, G, H, I, and J of this part relating to performance of electrical work.

(b) Pending issuance of Federal standards, a person will be considered, to the extent of the certification, a certified person to make examinations, tests and perform duties which are required by this Part 77 to be performed by a certified person:

(1) If he has been certified for such purpose by the State in which the coal mine is located; or

(2) If this person has been certified for such purpose by the Secretary. A person's initial certification is valid for as long as the person continues to satisfy the requirements necessary to obtain the certification and is employed at the same coal mine or by the same independent contractor. The mine operator or independent contractor shall make an application which satisfactorily shows that each such person has had at least 2 years experience at a coal mine or equivalent experience, and that each such person demonstrates to the satisfaction of an authorized representative of the Secretary that such person is able and competent to test for oxygen deficiency with a permissible flame safety lamp, or any other device approved by the Secretary and to test for methane with a portable methane detector approved by the Bureau of Mines, MESA, or MSHA, under Part 22 of this Chapter (Bureau of Mines Schedule 8C), and to perform such other duties for which application for certification is made. Applications for certification by the Secretary should be submitted in writing to the Mine Safety and Health Administration, Certification and Qualification Center, P.O. Box 25367, Denver Federal Center, Denver, Colorado 80225.

#### **77.101 Tests for methane and for oxygen deficiency; qualified person.**

(a) The provisions of Subparts C, P, R, and T of this Part 77 require that tests for methane and for oxygen deficiency be made by a qualified person. A person is a qualified person for these purposes if he is a certified person for such purposes under §77.100.

(b) Pending issuance of Federal standards, a person will be considered a qualified person for testing for methane and oxygen deficiency:

(1) If he has been qualified for this purpose by the State in which the coal mine is located; or

(2) If he has been qualified by the Secretary for these purposes upon a satisfactory showing by the operator of the coal mine that each such person has been trained and designated by the operator to test for methane and oxygen deficiency. Applications for Secretarial qualification should be submitted in writing to the Mine Safety and Health Administration, Certification and Qualification Center, P.O. Box 25367, Denver Federal Center, Denver, Colo. 80225

**77.102 Tests for methane; oxygen deficiency; qualified persons, additional requirement.**

Notwithstanding the provisions of §77.101, on and after December 30, 1971, no person shall be a qualified person for testing for methane and oxygen deficiency unless he has demonstrated to the satisfaction of an authorized representative of the Secretary that he is able and competent to make such tests and the Mine Safety and Health Administration has issued him a current card which qualifies him to make such tests

**77.103 Electrical work; qualified person.**

(a) Except as provided in paragraph (f) of this section, an individual is a qualified person within the meaning of Subparts F, G, H, I, and J of this Part 77 to perform electrical work (other than work on energized surface high-voltage lines) if:

(1) He has been qualified as a coal mine electrician by a State that has a coal mine electrical qualification program approved by the Secretary; or,

(2) He has at least 1 year of experience in performing electrical work underground in a coal mine, in the surface work areas of an underground coal mine, in a surface coal mine, in a noncoal mine, in the mine equipment manufacturing industry, or in any other industry using or manufacturing similar equipment, and has satisfactorily completed a coal mine electrical training program approved by the Secretary; or,

(3) He has at least 1 year of experience, prior to the date of the application required by paragraph (c) of this section, in performing electrical work underground in a coal mine, in the surface work areas of an underground coal mine, in a surface coal mine, in a noncoal mine, in the mine equipment manufacturing industry, or in any other industry using or manufacturing similar equipment, and he attains a satisfactory grade on each of the series of five written tests approved by the Secretary as prescribed in paragraph (b) of this section.

(b) The series of five written tests approved by the Secretary shall include the following categories:

(1) Direct current theory and application;

(2) Alternating current theory and application;

(3) Electric equipment and circuits;

(4) Permissibility of electric equipment; and,

(5) Requirements of Subparts F through J and S of this Part 77.

(c) In order to take the series of five written tests approved by the Secretary, an individual shall apply to the District Manager and shall certify that he meets the requirements of paragraph (a)(3) of this section. The tests will be administered in the Coal Mine Safety and Health Districts at regular intervals, or as demand requires.

(d) A score of at least 80 percent on each of the five written tests will be deemed to be a satisfactory grade. Recognition shall be given to practical experience in that 1 percentage point shall be added to an individual's score in each test for each additional year of experience beyond the 1 year requirement specified in paragraph (a)(3) of this section; however, in no case shall an individual be given more than 5 percentage points for such practical experience.

(e) An individual may, within 30 days from the date on which he received notification from the Administration of his test scores, repeat those on which he received an unsatisfactory score. If further retesting is necessary after his initial repetition, a minimum of 30 days from the date of receipt of notification of the initial retest scores shall elapse prior to such further retesting.

(f) An individual who has, prior to November 1, 1972, been qualified to perform electrical work specified in Subparts F, G, H, I, and J of this Part 77 (other than work on energized surface high-voltage lines) shall continue to be qualified until June 30, 1973. To remain qualified after June 30, 1973, such individual shall meet the requirements of either paragraph (a)(1), (2), or (3) of this section.

(g) An individual qualified in accordance with this section shall, in order to retain qualification, certify annually to the District Manager, that he has satisfactorily completed a coal mine electrical retraining program approved by the Secretary.

**77.105 Qualified hoistman slope or shaft sinking operation; qualifications.**

(a)(1) A person is a qualified hoistman within the provisions of Subpart T of this part, for the purpose of operating a hoist at a slope or shaft sinking operation if he has at least 1 year experience operating a hoist plant or maintaining hoist equipment and is qualified by any State as a hoistman or its equivalency, or

(2) If a State has no program for qualifying persons as hoistmen, the Secretary may qualify persons if the operator of the slope or shaft-sinking operation makes an application and a satisfactory showing that the person has had 1 year of experience operating hoists. A person's qualification is valid for as long as the person continues to satisfy the requirements for qualification and is employed at the same coal mine or by the same independent contractor.

(b) Applications for Secretarial qualification should be submitted to the Mine Safety and Health Administration, Certification and Qualification Center, P.O. Box 25367, Denver Federal Center, Denver, Colo. 80225.

**77.106 Records of certified and qualified persons.**

The operator of each coal mine shall maintain a list of all certified and qualified persons designated to perform duties under this Part 77.

**77.107 Training Programs.**

Each operator must submit to the district manager, of the Coal Mine Safety and Health District in which the mine is located, a program or plan setting forth what, when, how, and where the operator will train and retrain persons whose work assignments require that they be certified or qualified. The program must provide:

(a) For certified persons, annual training courses in the tasks and duties which they perform as certified persons, first aid, and the provisions of this Part 77; and

(b) For qualified persons, annual courses in performance of the tasks which they perform as qualified persons.

**Subpart C--Surface Installations**

**77.200 Surface installations; general.**

All mine structures, enclosures, or other facilities (including custom coal preparation) shall be maintained in good repair to prevent accidents and injuries to employees.

**77.201 Methane content in surface installations**

The methane content in the air of any structure, enclosure or other facility shall be less than 1.0 volume per centum.

**77.201-2 Methane accumulations; change in ventilation.**

If, at any time, the air in any structure, enclosure or other facility contains 1.0 volume per centum or more of methane changes or adjustments in the ventilation of such installation shall be made at once so that the air shall contain less than 1.0 volume per centum of methane.

**77.202 Dust accumulations in surface installations.**

Coal dust in the air of, or in, or on the surfaces of, structures, enclosures, or other facilities shall not be allowed to exist or accumulate in dangerous amounts.

**77.203 Use of material or equipment overhead; safeguards.**

Where overhead repairs are being made at surface installations and equipment or material is taken into such overhead work areas, adequate protection shall be provided for all persons working or passing below the overhead work areas in which such equipment or material is being used.

**77.204 Openings in surface installations; safeguards.**

Openings in surface installations through which men or material may fall shall be protected by railings, barriers, covers or other protective devices.

**77.205 Travelways at surface installations.**

- (a) Safe means of access shall be provided and maintained to all working places.
- (b) Travelways and platforms or other means of access to areas where persons are required to travel or work, shall be kept clear of all extraneous material and other stumbling or slipping hazards.
- (c) Inclined travelways shall be constructed of nonskid material or equipped with cleats.
- (d) Regularly used travelways shall be sanded, salted, or cleared of snow and ice as soon as practicable.
- (e) Crossovers, elevated walkways, elevated ramps, and stairways shall be of substantial construction, provided with handrails, and maintained in good condition. Where necessary toeboards shall be provided.
- (f) Crossovers shall be provided where it is necessary to cross conveyors.
- (g) Moving conveyors shall be crossed only at designated crossover points

**77.206 Ladders; construction; installation and maintenance.**

- (a) Ladders shall be of substantial construction and maintained in good condition.
- (b) Wooden members of ladders shall not be painted.
- (c) Steep or vertical ladders which are used regularly at fixed locations shall be anchored securely and provided with backguards extending from a point not more than 7 feet from the bottom of the ladder to the top of the ladder.
- (d) Fixed ladders shall not incline backwards at any point unless provided with backguards.
- (e) Fixed ladders shall be anchored securely and installed to provide at least 3 inches of toe clearance.
- (f) Fixed ladders shall project at least 3 feet above landings, or substantial handholds shall be provided above the landings.

**77.207 Illumination.**

Illumination sufficient to provide safe working conditions shall be provided in and on all surface structures, paths, walkways, stairways, switch panels, loading and dumping sites, and working areas.

**77.208 Storage of materials.**

- (a) Materials shall be stored and stacked in a manner which minimizes stumbling or fall-of-material hazards.
- (b) Materials that can create hazards if accidentally liberated from their containers shall be stored in a manner that minimizes the dangers.
- (c) Containers holding hazardous materials must be of a type approved for such use by recognized agencies.
- (d) Compressed and liquid gas cylinders shall be secured in a safe manner.
- (e) Valves on compressed gas cylinders shall be protected by covers when being transported or stored, and by a safe location when the cylinders are in use.

**77.210 Hoisting of materials.**

- (a) Hitches and slings used to hoist materials shall be suitable for handling the type of materials being hoisted.
- (b) Men shall stay clear of hoisted loads.
- (c) Taglines shall be attached to hoisted materials that require steadying or guidance.

**Subpart L – Fire Protection**

**77.1100 Fire protection; training and organization.**

Firefighting facilities and equipment shall be provided commensurate with the potential fire hazards at each structure, enclosure and other facility (including custom coal preparation) at the mine and the employees at such facilities shall be instructed and trained annually in the use of such firefighting facilities and equipment.

**77.1101 Escape and evacuation; plan.**

- (a) Before September 30, 1971, each operator of a mine shall establish and keep current a specific escape and evacuation plan to be followed in the event of a fire.

- (b) All employees shall be instructed on current escape and evacuation plans, fire alarm signals, and applicable procedures to be followed in case of fire.
- (c) Plans for escape and evacuation shall include the designation and proper maintenance of adequate means for exit from all areas where persons are required to work or travel including buildings and equipment and in areas where persons normally congregate during the work shift.

**77.1102 Warning signs; smoking and open flame.**

Signs warning against smoking and open flames shall be posted so they can be readily seen in areas or places where fire or explosion hazards exist.

**77.1103 Flammable liquids; storage.**

Flammable liquids shall be stored in accordance with standards of the National Fire Protection Association. Small quantities of flammable liquids drawn from storage shall be kept in properly identified safety cans.

**77.1104 Accumulations of combustible materials.**

Combustible materials, grease, lubricants, paints, or flammable liquids shall not be allowed to accumulate where they can create a fire hazard.

**77.1106 Battery-charging stations; ventilation.**

Battery-charging stations shall be located in well-ventilated areas. Battery-charging stations shall be equipped with reverse current protection where such stations are connected directly to direct current power systems.

**77.1109 Quantity and location of firefighting equipment.**

Preparation plants, dryer plants, tipples, drawoff tunnels, shops, and other surface installations shall be equipped with the following firefighting equipment.

- (a) Each structure presenting a fire hazard shall be provided with portable fire extinguishers commensurate with the potential fire hazard at the structure in accordance with the recommendations of the National Fire Protection Association.
- (c)(1) Mobile equipment, including trucks, front-end loaders, bulldozers, portable welding units, and augers, shall be equipped with at least one portable fire extinguisher.
- (2) Power shovels, draglines, and other large equipment shall be equipped with at least one portable fire extinguisher; however, additional fire extinguishers may be required by an authorized representative of the Secretary.
- (3) Auxiliary equipment such as portable drills, sweepers, and scrapers, when operated more than 600 feet from equipment required to have portable fire extinguishers, shall be equipped with at least one fire extinguisher.
- (c) Fire extinguishers shall be provided at permanent electrical installations commensurate with the potential fire hazard at such installation in accordance with the recommendations of the National Fire Protection Association.
- (e) Two portable fire extinguishers, or the equivalent, shall be provided at each of the following combustible liquid storage installations:
  - (1) Near each above ground or unburied combustible liquid storage station; and,
  - (2) Near the transfer pump of each buried combustible liquid storage tank.

(f) Vehicles transporting explosives and blasting agents shall be equipped with fire protection as recommended in Code 495, section 20, National Fire Protection Association Handbook, 12th Edition, 1962.

**77.1110 Examination and maintenance of firefighting equipment.**

Firefighting equipment shall be continuously maintained in a usable and operative condition. Fire extinguishers shall be examined at least once every 6 months and the date of such examination shall be recorded on a permanent tag attached to the extinguisher.

**77.1111 Welding, cutting, soldering; use of fire extinguisher.**

One portable fire extinguisher shall be provided at each location where welding, cutting, or soldering with arc or flame is performed.

**77.1112 Welding, cutting, or soldering with arc or flame; safeguards.**

(a) When welding, cutting, or soldering with arc or flame near combustible materials, suitable precautions shall be taken to insure that smoldering metal or sparks do not result in a fire.

(b) Before welding, cutting, or soldering is performed in areas likely to contain methane, an examination for methane shall be made by a qualified person with a device approved by the Secretary for detecting methane. Examinations for methane shall be made immediately before and periodically during welding, cutting, or soldering and such work shall not be permitted to commence or continue in air which contains 1.0 volume per centum or more of methane.

**Subpart R - Miscellaneous**

**77.1702 Arrangements for emergency medical assistance and transportation for injured persons; reporting requirements; posting requirements.**

(a) Each operator of a surface coal mine shall make arrangements with a licensed physician, medical service, medical clinic, or hospital to provide 24-hour emergency medical assistance for any person injured at the mine.

(b) Each operator shall make arrangements with an ambulance service, or otherwise provide for 24-hour emergency transportation for any person injured at the mine.

(c) Each operator shall, on or before September 30, 1971, report to the Coal Mine Health and Safety District Manager for the district in which the mine is located the name, title and address of the physician, medical service, medical clinic, hospital, or ambulance service with whom arrangements have been made, or otherwise provided, in accordance with the provisions of paragraphs (a) and (b) of this section.

(d) Each operator shall, within 10 days after any change of the arrangements required to be reported under the provisions of this section, report such changes to the Coal Mine Health and Safety District Manager. If such changes involve a substitution of persons, the operator shall provide the name, title, and address of the person substituted together with the name and address of the medical service, medical clinic, hospital, or ambulance service with which such person or persons are associated.



(e) Each operator shall, immediately after making an arrangement required under the provisions of paragraphs (a) and (b) of this section, or immediately after any change, of such agreement, post at appropriate places at the mine the names, titles, addresses, and telephone numbers of all persons or services currently available under such arrangements to provide medical assistance and transportation at the mine.

**77.1713 (a), (b), (c), (d) Daily inspection of surface coal mine; certified person; reports of inspection.**

(a) At least once during each working shift, or more often if necessary for safety, each active working area and each active surface installation shall be examined by a certified person designated by the operator to conduct such examinations for hazardous conditions and any hazardous conditions noted during such examinations shall be reported to the operator and shall be corrected by the operator.

(b) If any hazardous condition noted during an examination conducted in accordance with paragraph (a) of this section creates an imminent danger, the person conducting such examination shall notify the operator and the operator shall withdraw all persons from the area affected, except those persons referred to in section 104(d) of the Act, until the danger is abated.

(c) After each examination conducted in accordance with the provisions of paragraph (a) of this section, each certified person who conducted all or any part of the examination required shall enter with ink or indelible pencil in a book approved by the Secretary the date and a report of the condition of the mine or any area of the mine which he has inspected together with a report of the nature and location of any hazardous condition found to be present at the mine. The book in which such entries are made shall be kept in an area at the mine designated by the operator to minimize the danger of destruction by fire or other hazard.

(d) All examination reports recorded in accordance with the provisions of paragraph (c) of this section shall include a report of the action taken to abate hazardous conditions and shall be signed or countersigned each day by at least one of the following persons:

- (1) The surface mine foreman;
- (2) The assistant superintendent of the mine;
- (3) The superintendent of the mine; or,
- (4) The person designated by the operator as responsible for health and safety at the mine.

### **SECTION 3                      SURFACE INSTALLATION CHECKLIST**

1. Examine record books of daily inspections to determine whether inspections and hazardous conditions found are noted by certified persons.
2. Check for qualified and certified persons to determine whether such persons are available.
3. Check training plans and records to determine whether persons are being trained.
4. Check for emergency medical arrangements to determine whether arrangements are made.
5. Conduct a general overview inspection of surface facilities to discover any immediate dangers.
6. Check all mine structures to determine whether they are maintained in good repair.
7. Check on communications in the work area to determine whether communications are maintained to workers where hazardous conditions exist.
8. Check gratings and railings to determine whether they are structurally sound and clear of slipping and stumbling hazards.
9. Check accesses to work areas to determine whether they are safe.
10. Check structural changes to determine whether changes have created any new hazards.
11. Check employee work habits to determine whether workers follow safe procedures.
12. Check openings through which miners or materials may fall to determine whether they are properly guarded.
13. Check fixed ladders to determine whether they are anchored, in good repair, and back-guarded where required.
14. Check portable ladders to determine whether they are sound and anchored during use.
15. Test for methane to determine whether dangerous methane accumulations exist.
16. Check lighting to determine whether it is adequate.
17. Check Travelways, crossovers, and walkways to determine whether they are constructed and maintained for safety.

18. Check for dust accumulations to determine whether dangerous accumulations exist.
19. Check hoisting of materials to determine if hoisting is being done safely.
20. Check use of material overhead to detect hazardous conditions.
21. Check access doors to determine if doors are functional.
22. Examine fire extinguishers and fire fighting equipment.

## **SECTION 4 BASIC CHARACTERISTICS OF FIRE AND FIREFIGHTING AGENTS**

### **Complete Triangle**

Fire burns because three elements are present; heat, fuel and oxygen. In technical language, fire is a chemical reaction. It happens when a material unites with oxygen so rapidly that it produces flame. Think of fire as a triangle. If any one of the three sides; heat, fuel or oxygen is removed, the fire goes out. When a fire is extinguished, the heat is removed by cooling, the oxygen is removed by excluding air, the fuel is removed to a place where there is no flame, and the chemical reaction is stopped by inhibiting the oxidation of the fuel.

Cooling a fire requires applying an agent or agents, which absorbs heat. Water is the most common cooling agent and usually is applied in the form of a solid stream, finely divided spray, or incorporated in foam.

Flammable liquid storage tanks can be arranged so their contents can be pumped to an isolated empty tank in case of fire. When flammable gases catch fire as they are flowing from a pipe, the fire will go out if the valve is shut off.

Oxygen can frequently be removed or reduced from a fire by a wet blanket, throwing dirt on the fire, or covering the burning area with chemicals or mechanical foam. Other gases, which are heavier than air, such as carbon dioxide and vaporizing liquid, can be used to blanket the fire, preventing the oxygen from getting to the fire.

Recent studies have indicated that the familiar statement, "Removal of heat, fuel or oxygen, will extinguish a fire," does not apply when dry chemical or halogenated hydrocarbons are used as the extinguishing agents. These agents inactivate intermediate product of the flame reaction resulting in a reduction of the combustion rate (the rate of heat evolution) and extinguishes the fire.

We have always looked at fire from the perspective of a triangle; however, there is a fourth factor. During a fire, the complex molecules are broken down into simpler compounds and other substances. As the temperature increases and additional oxygen draws into the flame, new compounds and substances recombine and further break down. As these recombined molecules and substances reach their ignition point, they begin to burn, causing an increase in the temperature, drawing in additional oxygen, and forming new compounds and substances. This process continues until these substances reach a lower temperature. Therefore, as long as there is adequate fuel and oxygen, and the temperature is sustained, the chain reaction continues the combustion process.

### **Classification of Fires**

Class "A" fires occur in ordinary combustible materials which retain heat such as wood, cloth, paper, rubber, plastic, textiles, etc.

The most commonly used extinguishing agent is water, which cools and quenches. Fires of these materials are also extinguished by special dry chemicals for use on Class A, B and C fires. These provide a rapid knock down of flame and form a fire retardant coating which prevents reflash.

Class “B” fires occur in the vapor-air-mixture over the surface of flammable liquids such as greases, paint, gasoline and lubricating oils. A smothering or combustion inhibiting effect is necessary to extinguish Class “B” fires. Halon, dry chemical, foam, vaporizing liquids, carbon dioxide and water fog all can be used as extinguishing agents depending on the circumstances of the fire.

### **Characteristics of Flammable Liquids**

A layer of vapors always covers flammable liquids. When mixed with air and contacted by an ignition source, it is the vapor, not the liquid, which burns. The fuel vapor and oxygen provide two sides of the fire triangle. A flammable liquid is usually more dangerous when temperatures are high because more vapors are generated. Four terms commonly used with flammable liquids are:

- Flash Point – The lowest temperature at which a liquid gives off enough vapors to form a flammable mixture with air. Flash point of diesel is 100 to 120 degrees F. and gasoline is –50 degrees F.
- Fire Point – The lowest temperature at which the vapor-air-mixture will continue to burn after it is ignited. This is generally a few degrees above the flash point.
- Ignition Temperature – The temperature at which a mixture of flammable vapor and air will ignite without a spark or flame (spontaneous combustion). This term also applies to the temperature of a hot surface, which will ignite flammable vapors. The temperature varies with the type of surface.
- Flammable or Explosive Range – The range between the smallest and largest amounts of vapor in a given quantity of air which will explode or burn when ignited (usually expressed in percentages.) For instance, carbon disulfide has an explosive range of one to 50 percent. If air contains more than one or less than 50 parts of carbon disulfide vapor, the mixture can explode or burn.
- Gasoline as a Fire Hazard – The most commonly known flammable liquid is gasoline. It has a flash point of about –50 degrees F., a comparatively low figure. Burning gasoline has a temperature above 1500 degrees F.; therefore, it can heat objects in the fire area above its ignition temperature. To prevent re-ignition after extinguishment, the agent should be applied for a sufficient time to allow hot objects in the fire area to cool below the ignition temperature of the gasoline. It is dangerous to use water in a solid stream on a gasoline fire because it may spatter the fuel or raise its level in a container so it overflows.

The flammable range of gasoline is only 1.3 percent to 6 percent. Gasoline vapors are heavier than air. They tend to flow downhill and downwind from liquid gasoline, making

it possible for explosive mixtures to collect in low points such as pipe trenches or terrain depressions. If the amount of oxygen in a given atmosphere is reduced from its normal 21 percent to 14 percent by diluting with carbon dioxide, most petroleum products cannot burn. As a result, a gasoline fire can be “suffocated” by diluting the atmosphere with an inert gas.

Class “C” fires occur in electrical equipment where non-conducting extinguishing agents must be used. Dry chemical, carbon dioxide, and vaporizing liquids are suitable. Because foam, water (except as a spray), and water-type extinguishing agents conduct electricity, their use can kill or injure the person operating the extinguisher, and damage electrical equipment. (Halon must not be used underground.)

Class “D” fires occur in combustible metals such as magnesium, titanium, zirconium, sodium, and potassium. Some metals can produce their own oxygen. Specialized techniques, extinguishing agents and extinguishing equipment have been developed to control and extinguish fires of this type. Normal extinguishing agents must not be used on metal fires as there is danger in most cases of increasing the intensity of the fire because of a chemical reaction between the burning metal and some extinguishing agents.

**SECTION 5**

**SAMPLE QUESTIONS**

1. Q. How often should surface electric equipment and wiring be inspected by a certified person to assure safe operating condition?  
A. Monthly
2. Q. What shall be maintained on all surface mine power circuits?  
A. Power circuits shall be labeled to indicate the unit or circuit they control.
3. Q. Who is allowed to perform electrical work at surface installations?  
A. A certified electrical repairman who is certified for the surface or underground.
4. Q. What kind of sign shall be posted at all transformer stations?  
A. Suitable danger signs.
5. Q. Before working on a power circuit or electric equipment, who must de-energize, lock out and tag the circuit?  
A. Persons exposed to the risk should the circuit or equipment be energized.
6. Q. Who is allowed to operate machinery and equipment?  
A. An authorized person who is task trained.
7. Q. Persons shall not work on or from a piece of mobile equipment in a raised position unless:  
A. The equipment is specifically designed to lift persons.
8. Q. After making repairs to machinery:  
A. All guards and shields should be replaced before machinery is put into operation.
9. Q. Adequate guards shall be maintained on:  
A. Gears, sprockets, and pulleys; shafting and projecting shaft ends that are within seven feet of the floor; and circular and band saws.
10. Q. What is the duty of the surface facilities foreman relative to new employees hired to work at a shop?  
A. To instruct each new employee of the dangers incident to his job task.
11. Q. What is required to be completed and submitted by applicants for the surface facilities foreman?  
A. BOE-1A and BOE-2A, relating to application and work experience, and first aid certificate, first responder or 5000-23 certificate.
12. Q. What work experience is required prior to being certified as a surface facilities foreman?  
A. Applicant shall possess one year work experience at a shop, lab or warehouse or appropriately related work experience approved by the Division of Mines.

13. Q. The surface facilities foreman certification can be used in lieu of:  
A. No certifications. The surface facilities foreman certification is for shops, labs or warehouses.
14. Q. What kind of fire fighting equipment must be on all mobile equipment?  
A. At least one portable fire extinguisher.
15. Q. How often shall fire-fighting equipment be examined?  
A. At least once every 6 months.
16. Q. What shall be reported immediately to the Chief or designated representative?  
A. Any imminent danger condition which cannot be removed within a reasonable time, accidents involving serious personal injury or death, serious fires or unplanned explosions.
17. Q. Combustible materials, such as grease, paints or other flammable liquids, shall not be allowed to:  
A. Accumulate where they will create a fire hazard.
18. Q. Where are employees prohibited from smoking or using an open flame?  
A. Within 25 feet of where flammable liquids are stored or handled.
19. Q. Oxygen and acetylene bottles shall be:  
A. Stored in racks designated and constructed for the storage of such bottles.
20. Q. What should be a good practice in and around all work areas?  
A. Good housekeeping.
21. Q. Steps, landings, platforms and walkways should be kept free of:  
A. Oil, grease and ice.
22. Q. What precautions shall be taken when painting in shops or warehouses?  
A. Painting shall be performed in a well-ventilated atmosphere.
23. Q. When and where shall lights be provided for surface structures and areas outside surface structures?  
A. Lights shall be provided as needed and for roads, paths and walks if used at night.
24. Q. What eye protection shall be provided at stationary grinding wheels?  
A. Eye shields or goggles.
25. Q. Where should eye protection be worn?  
A. Where hazards exist from flying materials.
26. Q. Where shall hard-toe footwear be worn?  
A. Hard-toe footwear shall be worn in and around mines.



27. Q. Where shall hard hats be worn?  
A. Hard hats are required in and around mines where falling objects may cause injury.
28. Q. Automatic circuit breakers devices and fuses shall be installed so as to protect equipment and power circuits from:  
A. Excessive overload
29. Q. Before work is conducted on electrical or mechanical equipment, disconnecting devices shall be:  
A. Locked and tagged out
30. Q. When not in use, dippers, buckets, scraper blades and similar moveable parts shall be:  
A. Secured or lowered to the ground
31. Q. What type of hitches and slings shall be used to hoist materials?  
A. Suitable for the type of material being hoisted.
32. Q. What shall be attached to hoisted materials that require steadying or guidance?  
A. Taglines.
33. Q. How often shall each active surface installation be examined by a certified person?  
A. At least once during each working shift or more often if necessary for safety.
34. Q. What are the requirements of the records when a certified person examines an active surface installation?  
A. A record book shall be kept at the mine, with action taken to abate hazards and shall be countersigned.
35. Q. What are the requirements when, at any time, the air in any structure, enclosure or other facility contains 1.0 volume per centum of methane?  
A. Changes or adjustments in the ventilation of such installation shall be made at once.
36. Q. Travel-ways and platforms where persons are required to travel or work shall be kept clear of:  
A. Stumbling or slipping hazards.
37. Q. What safety devices should be used when working above ground level?  
A. Wear a safety belt or harness.
38. Q. What must be provided in and on all surface structures, paths, walkways, stairways, switch panels and working areas?  
A. Sufficient illumination.

39. Q. Opening in surface installations through which men or material may fall shall be protected by:  
A. Railings, barriers, covers
40. Q. Steep or vertical ladders, which are used regularly at fixed locations shall be:  
A. Anchored securely.

**SECTION 6**

**Surface Facilities Foreman Certification  
On-shift Records (SFF Exam)  
Student Study Guide**

The examiner must utilize the completed On-shift report forms and the examination exercise provided to key grading of the On-shift section of the exam. Discretion may be used in evaluating how hazardous conditions and action taken are recorded. The score for this section of the examination includes discount totals from both the identifying hazardous conditions portion and the On-shift report portion of the exam. The following discounts will be given for each prescribed area listed:

<u>Area</u>	<b>Discount Points</b>
• Failure to identify hazardous condition	3
• Failure to record hazardous condition	3
• Failure to record action taken when correcting hazardous condition	2
• Failure to record other required information other than hazardous condition or action taken	1

## **Surface Facilities Foreman Certification On-shift Exercise Instructions (SFF Exam) Student Study Guide**

**Exam Instructions:** You are required to read the following scenario and complete the attached forms as part of your examination.

You are a surface facilities foreman, certification number 01525, employed at the Clean Coal Lab and Sampling Company. On Monday, March 8, 2005, you begin your on-shift examination of your work area at approximately 8:00 A.M., completing it by 10:00 A.M.

Your examination begins at the coal storage area located at the back of the laboratory. The loader operator had completed a pre-op inspection of the Caterpillar 77 Loader and found the headlights inoperative. The loader operator stated he would report this to the repairman.

The coal sampling facility was next examined. Here you notice that the ramp area leading to the bag storage room has loose coal on the runway. You have one of your personnel clean the loose coal up. As you examined the sampling room, you notice that a guard was missing off the grinding augers for the #9 sampler. Also, two 110 volt outlet covers next to the sampler have been damaged exposing lead wires to the outlets. Both the #9 sampling auger and the two outlets have been taken out of service.

You later travel to examine the lab work area. All fire extinguishers, fire hoses and water hydrants located in the lab were examined and found to be in compliance. Five (5) coal blenders were examined. The #2 blender deflector glass, reported to be broken, had been removed and not replaced. The blender was still being utilized. You had the blender taken out of service.

As you examine the picking table, you notice that the guard was missing off the drive pulley. You have the certified electrician replace the guard.

Discussions you have with him reveal that the door for the laboratory breaker box had been left open. It is a requirement to keep the breaker box closed and locked. He also informs you that the #2 welder located in the parts room was knocked over. It appeared to have the outside casing damaged exposing the internal components. The welder was not in use.

10/26/05  
jpt

**Surface Facilities Foreman Certification  
On-shift Exercise Instructions (SFF Exam)  
Student Study Guide**

- Read the exercise statement provided
- Identify hazardous conditions by marking the appropriate boxes. (**Note: A hazardous condition is defined as a condition that is likely to cause death or serious personal injury to persons exposed to such conditions.**)
- All conditions identified as hazardous conditions shall require corrective action to be taken.
- Any condition marked below that is **not** a hazardous condition will be discounted. **All** hazardous conditions marked below must be entered in the On-shift examination records.
- Complete the On-shift examination records attached.

- [ ] Head lights inoperative on the Caterpillar 77 loader
- [ ] Loose coal located on the ramp leading to the bag storage room
- [ x] Guard missing off the #9 sampler grinding auger
- [ x] 110 volt outlet covers next to the #9 sampler damaged exposing lead wires
- [ ] #2 blender deflector glass missing
- [ x] Guard missing off the drive pulley for the picking table
- [ ] **Breaker box for the laboratory left unlocked**
- [ ] Outside casing to the #2 welder damaged exposing internal components

**Surface Facilities Foreman Certification  
On-shift Examination Report (SFF Exam)  
Student Study Guide**

Date of Examination 3/8/05      Facility/Area Examined Clean Coal Lab and Sampling Company

Time of Examination 8 – 10 AM    Day Shift X Evening Shift \_\_\_\_\_ Midnight Shift \_\_\_\_\_

Results of On-shift Examinations

Location	Hazardous Condition	Action Taken
Coal Storage Area		
Sampling Facility	Guard missing off the #9 sampler grinding auger	Taken out of service
	Outlet covers damaged at #9 sampler	Taken out of service
Laboratory	Guard missing off the drive pulley for picking table	Replaced

\*Work Area    \*Shop    \*Lab    \*Warehouse

Condition of mobile equipment

Head lights inoperative on the Caterpillar 77 loader - Reported

Condition of structures, travelways, walkways

Loose coal located on the ramp leading to the bag storage room. Cleaned up

Condition of electrical installations and lighting

.Outlet covers at the #9 sampler damaged exposing leads. Taken out of service

#2 welder in parts room at lab has outside casing damaged exposing internal components

Condition of portable electrical equipment (hand drills, grinders, etc.)

Other conditions

Guard missing off the #9 sampler grinding auger. Taken out of service

#2 blender deflector glass missing. Taken out of service

Guard missing off the drive pulley for the picking table. Replaced

Condition of fire fighting equipment

March 8, 2005

01525

Surface Facilities Foreman

Date

Certification Number

Operator/Agent

Date

10/26/05

jpt

## **REFERENCES**

Coal Mine Safety Laws of Virginia; Commonwealth of Virginia; Department of Mines, Minerals and Energy; 2005 Edition

Code of Federal Regulations; Title 30, Part 77; Office of Federal Register National Archives and Records Administration; 2006 Edition

MSHA's Surface Installation Manual, Coal Mine Entry Level Training

MSHA Miners Circular - #36R, U.S. Department of Labor